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Critical Respiratory Dysfunction and Role of Chest Physiotherapy in Sars Cov-2 Pandemic: a Case Series

Shailendra Pal Singh¹, Suraj Kumar², Gowrishankar Potturi^{3*} and Raj Kumar⁴

¹Professor and Head, Department of General Surgery, Uttar Pradesh University Of Medical Sciences, Saifai, Etawah, UP, India

²Associate Professor and Head, Dept. of Physiotherapy, Faculty of Paramedical sciences, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, UP, India

³Department of Physiotherapy, Faculty of Paramedical Sciences, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, India

⁴MCh. PhD (Ayurveda), DSc. Vice-chancellor, Uttar Pradesh university of Medical Sciences, Saifai, Etawah, Uttar Pradesh, India

***Corresponding author:** Gowrishankar Potturi, Department of Physiotherapy, Faculty of Paramedical Sciences, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, UP, India

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Abstract

COVID-19 is a serious burden on the health care workers, administration and government on critical care resources due to large burden of cases requiring critical care. The spectrum of disease ranges from influenza like illness to fever, cough, fatigue, sputum production and shortness of breath. Early intervention with chest physiotherapy can prevent the need for intubation in COVID-19 patients with respiratory distress. Seven cases from ICU and Eight cases from the Isolation ward were selected for current study. All cases were RT-PCR positive. The patients were assessed for the SPO2 levels, Level of dyspnea, Anxiety and depression levels by Hospital anxiety and depression scale (HADS) pre intervention and post intervention. After the physiotherapy sessions, it was observed that the recovery is speeded and the patients anxiety and depression levels also decreased with increase in self-esteem and confidence in these cases. As we know that the COVID-19 cases suffer from dyspnea, reduced rate and depth of respiration, weakness, anxiety and depression which can increase the risk of mortality.

Early physiotherapeutic interventions in the form of NPF, PNF, ACBT, Accupressure, Aerobic activities improved the respiratory health along with reduction in anxiety and depression may result in good outcome in these cases. Early Physiotherapy when given regularly can avoid the need for mechanical ventilation, thus can prevent mortality in COVID-19 patients. Hence, early interventional physiotherapy can be incorporated in the scheduled treatment protocols of COVID-19 patients globally.

Keywords

COVID-19; ICU; Physiotherapy; Accupressure

Introduction

Severe acute respiratory syndrome corona virus 2 (SARSCoV2) is a highly contagious respiratory virus that spread rapidly among humans [1]. Fifteen percent of cases suffer from severe pneumonitis requiring critical care and oxygen support while 5 % become more critically ill needing intubation for artificial ventilator support. In a study by Xu Li et.al, the incidence of Acute respiratory distress syndrome (ARDS) was 15.6-31 % higher than other organ injuries in COVID-19 in developing countries. Most opted respiratory care in many countries being prone positioning, PEEP, mechanical ventilation. Physiotherapy is being adopted in many covid affected countries and coming into limelight in pulmonary rehabilitation in covid-19. Early intubation is recommended when there is severe hypoxemia with SPO₂ <90 mmHg [2]. Mortality during mechanical ventilation appears to be high [3]. Early intervention with chest physiotherapy can prevent the need for intubation in COVID-19 patients with respiratory distress. Chest physiotherapy focuses on airway clearance techniques, re-expansion collapsed segments of the lungs, maintaining adequate levels of oxygenation. These may delay or prevent the need of intubation and may facilitate early weaning and reducing the chances of re-intubation. Apart from the respiratory complications, COVID-19 patients also exhibit wide range of significant psychological stress that impacts the general health of the patient. This is a report on case series of 15 cases of SARS CoV-2 with respiratory dysfunction and the importance of Chest physiotherapy in SARS CoV-2 pandemic for avoiding mechanical ventilation, reducing the anxiety, depression and hence mortality rate by designing individualized treatment protocols for a better outcome. This is a report on case series of 15 cases of SARS CoV-2 with respiratory dysfunction and the importance of Chest physiotherapy in SARS CoV-2 pandemic for avoiding mechanical ventilation, reducing the anxiety, depression and hence mortality rate by designing individualized treatment protocols for a better outcome.

Methodology

The SARS-CoV-2 cases (N=15) were selected from ICU and Isolation ward following a recommendation for physiotherapy by senior physicians from Level 3 COVID hospital in Uttar Pradesh, India. Both males (N=13) and females (N=2) cases were selected for the study. An informed consent was taken from these

subjects.

Seven cases from ICU and eight cases from Isolation ward were selected for this study. All 15 cases were RT-PCR positive. The cases were assessed for the SPO2 levels, Level of dyspnea, anxiety and depression levels by Hospital anxiety and depression scale (HADS) pre intervention and post intervention. The cases with comorbidities were 7 and without comorbidities were 8 in number. The cases had bilateral pneumonitis with grade 3 dyspnea (Table 1). The study was conducted for a period of 2 months. All the cases were treated by qualified trained physiotherapists of the University hospital. Various physiotherapy techniques depending upon the individual needs were delivered daily, and few self exercises were taught to the cases with a provision of literature regarding the exercises to be done (Figure 1). The exercise literature was printed in local dialect and language (Hindi) for better understanding and adherence to exercises. The patients had frequently undergone sampling for required investigations and were screened by the senior treating physicians. The medical management was delivered by the physicians for disease and comorbidities. All the techniques were performed on the patient with proper donning of personal protective equipment (PPE). All necessary precautions and guidelines of donning and doffing were followed by the Physiotherapist. Along with the regular medications, the patients were also given Raj Nirwan Bati (RNB) [9] a proprietary medicine made from various minerals and Herbs along with Raj Nirwan Quath (RNQ) [10] a decoction made from herbs within university. The individual case details are described in (Table 2).

| GRADE | DESCRIPTION |
|-------|---|
| 1 | Difficulty in breathing on unaccustomed activities |
| 2 | Difficulty in breathing on accustomed activities |
| 3 | difficulty in breathing on Activities of daily living (ADL) |
| 4 | Difficulty in breathing at rest |
| 5 | Difficulty in breathing while lying flat (Orthopnea) |

Table 1: Grades of Dyspnea.

| Case NO | AGE/SEX | Ward Location | Comorbidities | Physiotherapy Sessions (Number) | SpO2 Before Rx | SpO2 After Rx | Dyspnea before Treatment | Dyspnea after treatment | HADS Score | | HADS Score | | Therapy Given* | Status |
|---------|---------|---------------|-------------------------------|---------------------------------|----------------|---------------|--------------------------|-------------------------|------------|---------|------------|---------|----------------|---------------------|
| | | | | | | | | | Depression | Anxiety | Depression | Anxiety | | |
| 1 | 70/F | ICU | Cancer breast with mastectomy | 10 | 84 | 94 | 3 | 1 | 16 | 16 | 11 | 10 | 1,2,3,4,6,7 | stable still in ICU |
| 2 | 45/M | ICU | Diabetes | 26 | 80 | 94 | 4 | 1 | 21 | 21 | 13 | 9 | 1,2,3,4,5,6,7 | Discharged |

| | | | | | | | | | | | | | | |
|----|----------|---------------------------|---|----|----|----|---|---|----|----|----|----|-------------------|----------------------------|
| . | 58/ M | ICU | Hyperte nsion with bradyca rdia | 5 | 84 | 95 | 3 | 1 | 16 | 16 | 11 | 10 | 1,2,4,7 | stable still in ICU |
| . | 65/ M | Isola tion War d | NIL | 10 | 90 | 94 | 3 | 1 | 12 | 10 | 5 | 5 | 1,2,3,4 ,6, | stable still in Ward |
| . | 45/ M | ICU | NIL | 5 | 88 | 96 | 3 | 1 | 17 | 17 | 11 | 13 | 1,2,3,4 ,6,7 | Discha rged |
| . | 31/ M | ICU | NIL | 6 | 90 | 98 | 3 | 1 | 15 | 18 | 9 | 10 | 1,2,3,4 ,5,6,7 | Discha rged |
| . | 34/ M | ICU | NIL | 10 | 88 | 94 | 3 | 1 | 20 | 15 | 14 | 12 | 1,2,3,4 ,6,7 | Discha rged |
| . | 48/ M | ICU | NIL | 10 | 88 | 94 | 3 | 1 | 13 | 16 | 9 | 11 | 1,2,3,4 ,6,7 | Discha rged |
| . | 60/ M | Isola tion War d | Diabete s | 10 | 94 | 98 | 3 | 1 | 14 | 18 | 9 | 6 | 1,2,3,4 ,6 | Discha rged |
| 0. | 39/ M | Isola tion War d | NIL | 10 | 94 | 98 | 3 | 1 | 10 | 11 | 2 | 2 | 1,2,3,4 ,6 | Discha rged |
| 1. | 32/F | Isola tion War d | NIL | 10 | 96 | 98 | 3 | 1 | 10 | 10 | 6 | 1 | 1,2,3,4 ,6 | Discha rged |
| 2. | 57/ M | Isola tion War d | Hyperte nsion | 10 | 96 | 99 | 3 | 1 | 10 | 14 | 9 | 8 | 1,2,3,4 ,6 | Discha rged |
| 3. | 54/ M | Isola tion War d | nil | 10 | 96 | 98 | 3 | 1 | 15 | 15 | 3 | 8 | 1,2,3,4 ,6 | stable still in Ward |
| 4. | 72/ M | Isola tion War d | nil | 10 | 90 | 96 | 3 | 1 | 15 | 14 | 7 | 7 | 1,2,3,4 ,6 | Discha rged |
| 5. | 40/ M | Isola tion War d | Squamo us Cell Carcino ma of | 8 | 90 | 98 | 3 | 1 | 14 | 14 | 6 | 6 | 1,2,3,4 ,6 | Discha rged |

| | | | | | | | | | | | | | | |
|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|
| | | | Mouth | | | | | | | | | | | |
|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|

* 1-ACBT, 2-NPF, 3-PNF, 4- Percussions, 5- Accupressure, 6-light Aerobics, 7-limb physiotherapy.

Table 2: Description of Various Covid Cases.

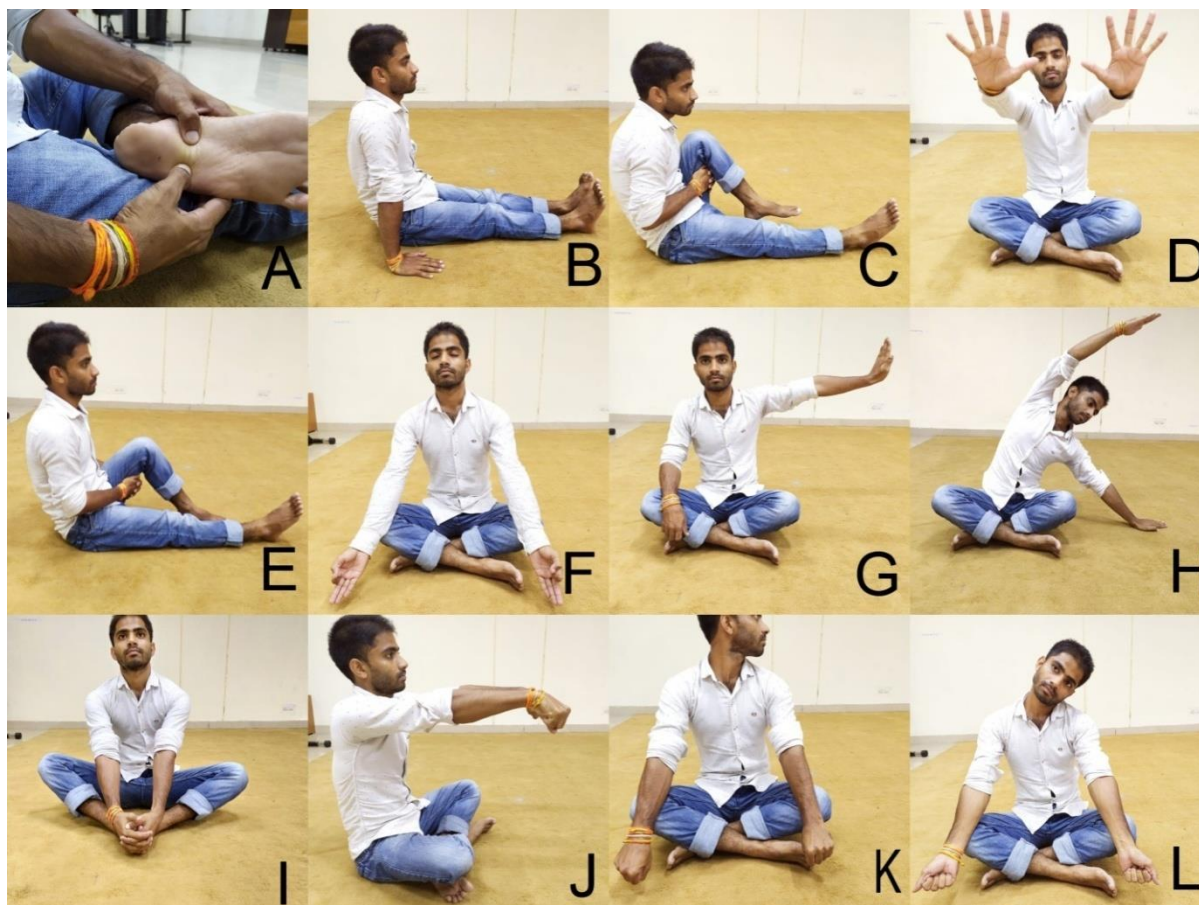


Figure 1: Active light exercises. A-Foot acupressure B-Foot exercise C-Knee to chest exercise D-Finger exercise E-Knee exercise F-Breathing exercise G-Shoulder exercise H-Trunk exercise I-Butterfly exercise J-Wrist exercise K-Neck rotation exercise L-Neck bending exercise.

Discussion

It was observed that the recovery was speeded up and the patient's anxiety and depression levels decreased with increase in self-esteem and confidence in these cases following appropriate physiotherapy sessions. The cases were admitted in ICU when they suffered from hypoxemia with SPO2 levels less than 90 to require either oxygenation or mechanical ventilation [11]. The case no.1,2,3,5,6,7,8, suffered from hypoxemia with SPO2 levels below 90 and were shifted to ICU for

Oxygenation. These cases were given ACBT (Active cycle of breathing technique), NPF (Neurophysiological facilitation of respiration), PNF (proprioceptive neuromuscular facilitation) of respiration, LU10 accupressure point stimulation. After a range of 5- 10 sittings, the SPO2 levels of these cases improved to a range of 94-98. In case number 2, the number of sessions given was 26, due to very poor perfusion of organs. In case number 2, due to sudden fall of SPO2 levels to 70, the physicians planned an intubation for patient to promote mechanical ventilation, but after the chest physiotherapy, the SPO2 levels gradually improved and the intubation could be avoided. Most of the cases had a Grade 3 dyspnea, which was reduced to grade 1 following regular physiotherapy sessions [5-10]. Percussions on the chest areas, started mechanical waves which would loosen the secretions in the lungs [12]. The patient's rate and depth of breathing was improved. NPF techniques induce a reflex respiratory movement by application of external proprioceptive and tactile stimuli that can alter the rate and depth of breathing [13]. Most of the cases suffered from restricted thoracic movements with difficulty in clearing the secretions, but after the chest physiotherapy the lung areas became clear to be evident on chest radiographs. ACBT techniques applied on these patients helped in clearing the chest and improving lung function [14]. The stimulation of ventilator muscles by proprioceptive and tactile stimuli by PNF techniques resulted in expansion of ribs, increased epigastric excursion, respiratory depth and rate [15]. It also properly aligns the respiratory muscles and respiratory rhythms [16]. The LU 10 accupressure point stimulation in these cases resulted in reduction of cough, dyspnea and improved SPO2 levels. The stimulation of LU10 acupressure point activates the lung meridian resulting in improved respiratory functions [17-19]. Case number 1,2,3,5 admitted in ICU have comorbidities which can result in significant functional decline resulting in ICU acquired weakness. None of the patients developed ICU acquired weakness even after staying for long duration in ICU ranging from 10-26 days. Regular chest physiotherapy, deep breathing exercises, ACBT and limb physiotherapy might have prevented ICU acquired weakness in these patients. All cases suffered from anxiety and depression, the HADS scores ranging from 12-21. It is observed that the anxiety levels were higher in patients admitted in ICU in comparison to those of Isolation ward. ICU is a complex and stressful environment that is associated with unfavorable physical, psychological, cognitive and functional consequences for patients [20]. Recent researches on COVID-19, it was evident that the prevalence rates of anxiety and depression is 23.2% and 22.8 % respectively [21,22]. The psychological stress in these patients can affect the immunity which has multifaceted effects including neuroendocrine and neurotransmitter interactions [23]. The light aerobic activities taught to these patients resulted in reduction of anxiety and depression levels. The anxiety and depression levels reduced with physical activity. Neurotransmitter release, neurotrophic factor, neurogenesis and cerebral blood flow alteration are some of the concepts involved. The regular minimums to moderate aerobic exercises and deep breathing exercises have immediate effects on the anxiety and depression. They reduce the anxiety and depression levels after single sessions of exercise by endorphin and monoamine hypotheses.

Conclusion

This study concludes that Chest physiotherapy, psychological counseling is helpful in COVID-19 pneumonitis symptoms like dyspnea, hypoxemia, hospital acquired anxiety and depression, avoiding mechanical ventilation by ACBT, NPF, PNF, Accupressure and light aerobic activities as seen in the study

of 15 cases of ICU and isolation ward. Hence, early interventional physiotherapy can be incorporated in the scheduled treatment protocols of COVID-19 patients globally.

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